Instructions: This quiz is closed book, closed note, and an individual effort. Electronic devices other than approved calculators are not allowed on your person (e.g., no cell phones or calculators with CAS). Answer each question. **Show all work to receive full credit.** Unless the question specifies, you may provide either an exact answer or round to two decimal places. If you get stuck, please attempt to explain what you want to do. This may give more partial credit.

1. A city's population was 30,000 in the year 2010 and was 52,000 in 2018.

   (a) (4 points) What is the average rate of change for the city's population, P, from 2010 to 2018 in terms of the number of years, t? Interpret the meaning of this in the context of the problem.

   (b) (2 point) Find a linear function modeling the relationship over the 8 year span.

2. Production costs for manufacturing running shoes consists of a fixed overhead $650,000 plus a variable cost of $20 per shoe. Each pair of shoes sells for $70.

   (a) (2 point) Find the cost function for the above in terms of quantity produced.

   (b) (2 point) Find the revenue function for the above in terms of quantity sold.

   (c) (2 point) Find the profit function for the above in terms of quantity.

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(d) (3 points) Find the marginal cost, marginal revenue, and marginal profit for the above.

3. (5 points) If demand is given by $q = D(p) = 120,000 - 500p$ and supply is given by $q = S(p) = 1000p$, what is the equilbrium price and quantity?